REMARKS

INTRODUCTION

In accordance with the foregoing, claims 1, 2, 4, 7, 10, 11, 13, and 17 have been amended. No new matter has been submitted, and reconsideration of the pending claims is respectfully requested.

Claims 1-18 are pending and under consideration, noting that claims 7 and 8 have been indicated as including allowable subject matter. Accordingly, claim 7 has been amended into independent form, placing claims 7 and 8 into allowable condition.

REJECTION UNDER 35 USC 102

Claims 1-6 and 9-18 stand rejected under 35 U.S.C. 102(e) as being anticipated by Yoshiyuki, JP 2002-279739. This rejection is respectfully traversed.

To ensure understanding of Yoshiyuki, applicants have attached portions of a mechanical translation of Yoshiyuki provided by the Japanese Patent Office.

As explained in Yoshiyuki, there are only two disclosed or suggested flat springs 4a and 4b, with flat springs 4a and 4b sequentially providing respective elastic forces against the rack 3, and with the rack 3 contacting the spiral groove. The rack 3 is not an elastic body and is used only as a conventional mechanism to interact with the spiral groove and the optical pickup.

In the presently claimed invention, the rack 3 can only be interpreted as corresponding to the claimed contact parts, e.g., see claim 1, "one or more contact parts engaging the spiral groove formed on the lead screw, and applying a force to the optical pickup unit in response to the rotation of the lead screw, wherein the force moves the optical pickup unit." All independent claims include a reference to contacts parts.

Accordingly, it is respectfully submitted that the rack 3 of Yoshiyuki can only correspond to the claimed contact parts.

The Office Action indicates on page 3 that the rack 3 of Yoshiyuki can also be interpreted as the claimed elastic member and/or the first elastic section.

However, the rack 3 is not an elastic body, and as illustrated in Yoshiyuki, rack 3 is a separate body from flat springs 4a and 4b. Further, the rack 3 would not have been an elastic body, since the purpose of the rack 3 is to firmly engage the spiral screw. The flat springs 4a and 4b perform the elastic function of either forcing rack 3 toward the spiral screw or prevent the rack 3 from jumping out of the spiral screw grooves.

Thus, rack 3 should not be interpreted as an elastic body. Accordingly, Yoshiyuki can only be interpreted as including two elastic sections/bodies.

Lastly, the Office Action has indicated that the elastic member of Yoshiyuki "is a viscoelastic material having a damping characteristic (inherent)."

However, Yoshiyuki only discloses "elastic" bodies. The flat springs of Yoshiyuki are not viscoelastic bodies. Viscoelastic solids are solids that provide both elastic properties and viscous properties. As described in the attached discussion of "Viscoscity," the first paragraph on page 5 details that "[m]aterials for which both their viscosity and their elasticity are important in a particular range of deformation and deformation rate are called *viscoelastic*."

Thus, though the flat springs 4a and 4b of Yoshiyuki are elastic bodies, they do not have any substantial viscous properties. Conversely, embodiments of the present invention set forth particular examples of bodies that have both substantial elastic and viscous properties, i.e., viscoelastic materials. It is respectfully submitted that Yoshiyuki further fails to provide any support or disclosure suggesting the same.

Accordingly, independent claims 1, 9, 10, 16, and 17 all claim that the elastic member is a viscoelastic material. It is respectfully submitted that Yoshiyuki fails to disclose or suggest the claimed viscoelastic material. Conversely, as noted above, embodiments of the present application solve similar problems as those in Yoshiyuki, but in different manners, and in different ways. Yoshiyuki would not be open to the viscoelastic material feature of claims 1, 9, 10, 16, and 17, without using the present application as motivation for the same.

Further, it is respectfully submitted that the claimed third elastic section of independent claims 4 and 13 similarly are not disclosed by Yoshiyuki. As noted above, Yoshiyuki only discloses two elastic bodies. Further, there would not be any need for an additional elastic body in Yoshiyuki, as the existing two elastic bodies perform the desired operation. There is no suggestion in Yoshiyuki how a third elastic body would be implemented and what purpose the same would achieve.

Lastly, independent claims 2 and 11 set forth that the second elastic section is formed by a body, and that "at least one protrusion from the body forming the first elastic section." The Office Action would appear to set forth that the teeth of the rack 3 engaging the spiral screw meets the claimed protrusion.

However, as noted above, the rack 3 is not an elastic body. Thus, as neither flat spring 4a or 4b form a body from which the other flat spring 4a or 4b protrudes from, Yoshiyuki cannot be considered as disclosing this claimed feature. Yoshiyuki can only be considered as

disclosing or suggesting two distinct elastic spring bodies, failing to disclose or suggest that one elastic body will protrude from the other elastic body.

Therefore, it is respectfully submitted that all pending claims are patentably distinguishable over Yoshiyuki. Accordingly, it is respectfully submitted that claims 1-18 are in allowable condition, and withdrawal of these rejections is respectfully requested.

CONCLUSION

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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Date: October 11, 2005

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Viscosity

Viscosity is a measure of the resistance of a fluid to deformation under shear stress. It is commonly perceived as "thickness", or resistance to pouring. Viscosity describes a fluid's internal resistance to flow and may be thought of as a measure of fluid friction. Thus, water is "thin", having a low viscosity, while vegetable oil is "thick" having a high viscosity.

Newton's theory

When a shear stress is applied to a solid body, the body deforms until the deformation results in an opposing force to balance that applied, an equilibrium. However, when a shear stress is applied to a fluid, such as a wind blowing over the surface of the ocean, the fluid flows, and continues to flow while the stress is applied. When the stress is removed, in general, the flow decays due to internal dissipation of energy. The "thicker" the fluid, the greater its resistance to shear stress and the more rapid the decay of its flow.

In general, in any flow, layers move at different velocities and the fluid's "thickness" arises from the shear stress between the layers that ultimately opposes any applied force.

Isaac Newton postulated that, for straight, parallel and uniform flow, the shear stress, τ, between layers is proportional to the velocity gradient, ∂u/∂y, in the direction perpendicular to the layers, in other words, the relative motion of the layers.

tau=mu frac{partial u} {partial y}.

Here, the constant μ is known as the *coefficient of viscosity*, *viscosity*, or

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dynamic viscosity. Many fluids, such as water and most gases, satisfy Newton's criterion and are known as Newtonian fluids. Non-Newtonian fluids exhibit a more complicated relationship between shear stress and velocity gradient than simple linearity.

In many situations, we are concerned with the ratio of the viscous force to the inertial force, the latter characterised by the fluid density ρ. This ratio is characterised by the *kinematic viscosity*, defined as follows:

nu = frac {mu} {rho}.

James Clerk Maxwell called viscosity *fugitive elasticity* because of the analogy that elastic deformation opposes shear stress in solids, while in viscous fluids, shear stress is opposed by *rate* of deformation.

Viscosity is the principal means by which energy is dissipated in fluid motion, typically as heat.

Measurement of viscosity

Viscosity is measured with various types of viscometer, typically at 25°C (standard state).

Units

Viscosity (dynamic viscosity)

The SI physical unit of dynamic viscosity is the pascal-second (Pa·s), which is identical to 1 N·s/m^2 or 1 kg/(m·s). In France there have been some attempts to establish the *poiseuille* (Pl) as a name for the Pa·s but without international success. Care must be taken in not confusing the poiseuille with the poise named after the same person!

The cgs physical unit for dynamic viscosity is the *poise* (P) named after Jean Louis Marie Poiseuille. It is more commonly expressed, particularly in ASTM standards, as *centipoise* (cP). The centipoise is commonly used because water has a viscosity of 1.0 cP (at 20 °C).

1 poise = 100 centipoise = 1 g/(cm·s) = 0.1 Pa·s.

Kinematic viscosity

The SI physical unit of kinematic viscosity is the (m^2/s). The cgs physical unit for kinematic viscosity is the *stokes* (abbreviated S or St), named after George Gabriel Stokes. It is sometimes expressed in terms of *centistokes* (cS or cSt). In U.S. usage, *stoke* is sometimes used as the singular form.

1 stokes = 100 centistokes = 1 cm^2/s = 0.0001 m^2/s.

Molecular origins

The viscosity of a system is determined by how molecules constituting the system interact. There are no simple but correct expressions for the viscosity of a fluid. The simplest exact expressions are the Green-Kubo relations for the linear shear viscosity or the Transient Time Correlation Function expressions derived by Evans and Morriss in 1985. Although these expressions are each exact in order to calculate the viscosity of a dense fluid, using these relations requires the use of molecular dynamics computer simulation.

Gases

Viscosity in gases arises principally from the molecular diffusion that transports momentum between layers of flow. The kinetic theory of gases allows accurate prediction of the behaviour of gaseous viscosity, in particular that, within the regime where the theory is applicable:

- Viscosity is independent of pressure; and
- Viscosity increases as temperature increases.

Liquids

In liquids, the additional forces between molecules become important. This leads to an additional contribution to the shear stress though the exact mechanics of this are still controversial. Thus, in liquids:

- Viscosity is independent of pressure (except at very high pressure); and
- Viscosity tends to fall as temperature increases. See temperature dependence of liquid viscosity

The dynamic viscosities of liquids are typically several orders of magnitude higher than dynamic viscosities of gases.

Viscosity of some common materials

Some dynamic viscosities of Newtonian fluids are listed below:

Gases (at 0 °C): :

	viscosity (Pa·s)
hydrogen	8.4×10^{-6}

air	17.4×10^{-6}
xenon	21.2×10^{-6}

Liquids (at 20 °C): :

	viscosity (Pa·s)
ethyl alcohol	0.248×10^{-3}
acetone	0.326×10^{-3}
methanol	0.59×10^{-3}
benzene	0.64×10^{-3}
water	1.025×10^{-3}
nitrobenzene	2.0×10^{-3}
mercury	17.0×10^{-3}
sulfuric acid	30×10^{-3}
olive oil	81×10^{-3}
castor oil	0.985
glycerol	1.485
pitch	10^{7}

Many fluids such as honey have a wide range of viscosities.

Can solids have a viscosity?

It is commonly asserted that amorphous solids, such as glass, have viscosity, arguing on the basis that all solids *flow*, to some possibly minuscule extent, in response to shear stress. Advocates of such a view hold that the distinction between solids and liquids is unclear and that solids are simply liquids with a very high viscosity, typically greater than 10^{12} Pa·s. This position is often adopted by supporters of the widely held urban myth that glass flow can be observed in old buildings.

However, others argue that solids are, in general, elastic for small stresses while fluids are not. Even if solids flow at higher stresses, they are characterized by their low-stress behavior. Viscosity may be an appropriate characteristic for solids in a plastic regime. The situation becomes somewhat confused as the term *viscosity* is sometimes used for solid materials, for example Maxwell materials, to describe the relationship between stress and the rate of change of strain, rather than rate of shear.

These distinctions may be largely resolved by considering the constitutive equations of the material in question, which take into account both its viscous and elastic behaviors. Materials for which both their viscosity and their elasticity are important in a particular range of deformation and deformation rate are called *viscoelastic*. In geology, earth materials that exhibit viscous deformation at least three times greater than their elastic deformation are sometimes called rheids.

One example of solids flowing which has been observed since 1930 is the Pitch drop experiment.

Eddy viscosity

In the study of turbulence in fluids, a common practical strategy for calculation is to ignore the small-scale *vortices* (or *eddies*) in the motion and to calculate a large-scale motion with an *eddy viscosity* that characterizes the transport and dissipation of energy in the smaller-scale flow. Typical values of eddy viscosity used in modeling ocean circulation are in excess of 10^7 Pa·s.

Fluidity

The reciprocal of viscosity is *fluidity*, usually symbolised by φ ($=1/\mu$), measured in *reciprocal poise* (cm·s/g), sometimes called the *rhe*. *Fluidity* is seldom used in engineering practice.

Etymology

The word "viscosity" derives from the Latin word "viscum" for mistletoe. From the mistletoe berries a viscous glue has been made and used for lime-twigs to catch birds.

See also

- Thixotropy
- Dilatant

Bibliography

- Massey, B S (1983) *Mechanics of Fluids*, fifth edition, ISBN 0442305524

Download free Viscosity- und Rheology E-book in English and German (warning: PDF files):

- *Introduction to Rheology by Gebhard Schramm in English language*
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- **Viscosity** is also an out-of-print image and animation editing utility published by Sonic Foundry. It can work with PNG, GIF, JPG/JPEG, BMP, AVI and its native VSC format.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention has the description which does not produce especially a gear-tooth jump of a rack about the optical pickup delivery device of an optical disk unit.
[0002]
[Description of the Prior Art] The optical pickup delivery device of the conventional optical disk unit is explained below. Drawing 6 a is the perspective view showing the outline configuration of the conventional optical pickup delivery device. Drawing 6 R>6b is the perspective view which expanded the rack mounting section of the conventional optical pickup delivery device.
[0003] drawing 6 a -- setting -- a leading screw 1 -- a revolution -- being free (**** -- B to kick) -- the optical pickup body 2 -- a disk -- radially -- being movable (A in drawing) -- it is supported. The flat spring 4 for carrying out the pressure welding of the rack 3 attached in the optical pickup body 2 to a leading screw 1 ****s, and it is being fixed to the optical pickup body 2 by 5, and a rack 3 gears with a leading screw 1 by the elasticity of flat-spring 4a shown in drawing 6 b, and when a leading screw 1 rotates by the optical pickup delivery motor (with no graphic display), the optical pickup body 2 is sent to disk radial [A].
[0004]
[Problem(s) to be Solved by the Invention] However, when the energization force was too weak, and producing the unprepared gear-tooth jump and strengthening the energization force at reverse, it was [be / although / it was effective in actuation of the optical pickup body 2 when weakening the energization force of flat-spring 4a with said conventional configuration] effective in gear-tooth jump prevention of a rack 3, but when the energization force was too strong, nonconformity, like actuation loads increase in number according to frictional force had arisen. Therefore, there was a problem that setting out of the energization force was not easy.
[0005] There was JP,2000-156054,A as a solution for that. As shown in drawing 7 , a step motor 6 and a leading screw 1 are used. [when arranging the limiter which counters a flat spring 4 and restricts the amount of displacement of a flat spring 4 to the leading-screw electrode holder 7 and using motors other than step motor 6] In order to have to form a stopper in the location which another components must be prepared as a stopper, and components mark also increase, and does not interfere in actuation of the optical pickup body 2, it was a configuration unsuitable for the thin optical disk unit which does not have allowances in a tooth space.
[0006] This invention solves the above-mentioned conventional technical problem, there are also few components mark, is a small tooth space, does not have buildup of the actuation load by frictional force, and aims at moreover offering the optical pickup delivery device and optical disk unit which do not produce a gear-tooth jump.

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[0007]
[Means for Solving the Problem] In order to solve said conventional technical problem, the optical pickup delivery device of this invention In the optical pickup delivery device to which an elastic body is fixed to an optical pickup body, the rack energized by the elastic body is engaged to a leading screw, and an optical pickup body is moved by the revolution of a leading screw An elastic body head approaches to the fitting location of the elastic body A which always acts, and a rack at the time of the revolution of a leading screw, and an elastic body does not act at the time of the usual leading-screw revolution. And in case a rack separates from a leading screw and a gear-tooth jump arises, by constituting from an elastic body B which acts on the variation rate of the direction from which a rack separates from a leading screw, the driving force to delivery of an optical pickup is large, and suppresses a gear-tooth jump.
[0008]
[Embodiment of the Invention] Invention according to claim 1 fixes an elastic body to an optical pickup body, and engages the rack energized by said elastic body to a leading screw. In the optical pickup delivery device to which said optical pickup body is moved by the revolution of said leading screw said elastic body An elastic body head approaches to the fitting location of the elastic body A which always acts, and said rack at the time of the revolution of said leading screw, and it does not act at the time of the usual leading-screw revolution. And in case said rack separates from said leading screw and a gear-tooth jump arises, by constituting from an elastic body B which acts on the variation rate of the direction from which said rack separates from said leading screw, the driving force to delivery of an optical pickup is large, and can suppress a gear-tooth jump.
[0009] In the optical pickup delivery device indicated by claim 1, when said elastic body is a flat spring, invention according to claim 2 does not need a tooth space, and its driving force to delivery of an optical pickup is large, and it can suppress a gear-tooth jump.
[0010] Invention according to claim 3 becomes possible [having the stopper of gear-tooth jump control] in the optical pickup delivery device indicated by claim 1 by using said elastic body A and said elastic body B as an integral part, without components mark also increasing.
[0011] In the optical pickup delivery device indicated by claim 1, invention according to claim 4 can heighten the depressor effect of a rack, when the elastic modulus of said elastic body B makes it larger than said elastic body A.
[0012] (Gestalt of operation) Below, the gestalt of implementation of invention indicated by claim 1 and claim 4 of this invention is explained using drawing 1 . Drawing 1 a is the perspective view showing the outline configuration of the optical pickup delivery device concerning this invention, and drawing 1 b is the perspective view which expanded the rack mounting section of the optical pickup delivery device concerning this invention.
[0013] In drawing 1 a, the leading screw 1 is supported free [a revolution] by the bearing which is not illustrated, and a leading screw 1 rotates by revolution actuation of an optical pickup delivery motor (with no graphic display) being transmitted to a leading screw 1 through a gear.
[0014] The flat spring 4 for carrying out the pressure welding of the rack 3 concluded by the optical pickup body 2 to a leading screw 1 is being fixed to the optical pickup body 2 with the screw thread 5.
[0015] A rack 3 gears with a leading screw 1 by the elasticity of flat-spring 4a shown in drawing 1 b, and it is guided so that it may be sent to radial [of the disk clamped by turntable 8a by which objective lens 2a with which the optical pickup body 2 is equipped

by the revolution B of a leading screw 1 is installed in the upper part of a spindle motor 8 / A].

[0016] Flat-spring 4b shown in drawing 1 b which acts on the variation rate of the direction from which a rack 3 separates from a leading screw 1 is being fixed so that the head of flat-spring 4b may approach a rack 3.

[0017] In the usual delivery actuation in which the optical pickup body 2 is sent to radial [of a disk / A] by having prepared flat-spring 4b which acts on the variation rate of the direction from which a rack 3 separates from a leading screw 1 When the force is applied in the direction in which a rack 3 runs aground with an impact etc., without being able to set the weak energization force as flat-spring 4a, and frictional force being too large and an actuation load increasing Since flat-spring 4b acts as a stopper to the variation rate of a rack 3, it is prevented that a rack 3 carries out a gear-tooth jump.

[0018] Although this example explained the elastic body as a flat spring, it cannot be overemphasized that you may carry out, for example using a coil spring, rubber material, resin material, etc.

[0019] Moreover, although this example is constituted as mentioned above, it may not be restricted to this, for example, flat-spring 4a and flat-spring 4b may be constituted from another components like drawing 2 , and, as for invention, flat-spring 4a and flat-spring 4b may be made the configuration which shows at anchoring and drawing 3 at a two-sheet pile.

[0020] Moreover, you may make it the configuration which shows the anchoring sequence of flat-spring 4a of a configuration of being shown in drawing 3 , and flat-spring 4b to drawing 4 made into reverse.

[0021] Moreover, things can raise depressor effect [as opposed to a gear-tooth jump of a rack 3 for flat-spring 4b] more greatly [spring constant] than flat-spring 4a.

[0022] Moreover, it is good also considering a flat spring 4 and a rack 3 as integral construction, and a rack 3 may be energized in the direction of [other than the direction of a chassis side]. Furthermore, a leading screw 1 may use the step motor which does not mind a gear.

[0023] Moreover, the dimensional tolerance of the gage pin on a rack 3 and the optical pickup body 2 for flat-spring 4 anchoring is large. When the thing to depend on flat-spring 4b and which it runs aground rack 3 and the effectiveness as a stopper to a direction becomes small is expected As shown in drawing 5 , it bends with metal mold so that the distance of flat-spring 4b which approaches rack 3b and rack 3b beforehand may become large, and the technique of using after an assembly and a fixture for the optical pickup body 2 for a leading screw 1, a rack 3, and a flat spring 4, and bending flat-spring 4b can also be taken. Under the present circumstances, since gear-tooth 4c of a leading screw 1 and a rack has geared and a rack 3 does not move in the direction of force F It is not concerned with the size of the straight force, and the deformation to the direction of force F of flat-spring 4b can be restricted, and it cannot be concerned with the dimension error of the locator pin for attaching the rack 3 of the optical pickup body 2, and a flat spring 4, but a flat spring 4 can be attached with a sufficient precision. in addition -- and it is possible to offer the optical pickup feed gear which does not become the actuation load of optical pickup usual delivery actuation.

[0024]

[Effect of the Invention] According to the optical pickup delivery device of this invention, in an optical pickup successive range, there is no buildup of an actuation load, moreover, a gear-tooth jump is not produced and a response also in a thin light disk drive is attained.

[Translation done.]

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] In the optical pickup delivery device to which an elastic body is fixed to an optical pickup body, the rack energized by said elastic body is engaged to a leading screw, and said optical pickup body is moved by the revolution of said leading screw The elastic body A on which said elastic body always acts at the time of the revolution of said leading screw An elastic body head approaches to the fitting location of said rack, and it does not act at the time of the usual leading-screw revolution. And the optical pickup delivery device characterized by consisting of elastic bodies B which act on the variation rate of the direction from which said rack separates from said leading screw in case said rack separates from said leading screw and a gear-tooth jump arises.
[Claim 2] The optical pickup delivery device according to claim 1 characterized by said elastic body being a flat spring.
[Claim 3] The optical pickup delivery device according to claim 1 characterized by said elastic body A and said elastic body B being integral parts.
[Claim 4] The optical pickup delivery device according to claim 1 characterized by the elastic modulus of said elastic body B being larger than said elastic body A.
[Claim 5] The optical disk unit characterized by using an optical pickup delivery device according to claim 4 from claim 1.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] (a) The perspective view showing the outline configuration of the optical pickup delivery device concerning this invention
(b) The perspective view which expanded the rack mounting section of the optical pickup delivery device concerning this invention
[Drawing 2] The perspective view showing the outline configuration of the optical pickup delivery device of another gestalt of this invention
[Drawing 3] The optical pickup delivery device perspective view of the gestalt shown in drawing 3 of this invention

[Drawing 4] The optical pickup delivery device perspective view of another gestalt of this invention
[Drawing 5] The side elevation explaining the rack mounting section of the optical pickup delivery device of another gestalt of this invention
[Drawing 6] (a) The perspective view showing the outline configuration of the conventional optical pickup delivery device
(b) The perspective view which expanded the rack mounting section of the conventional optical pickup delivery device
[Drawing 7] The conventional optical pickup delivery device explanatory view
[Description of Notations]
1 Leading Screw
2 Optical Pickup Body
2a Objective lens
3 Rack
3a Flat-spring contact section
3b The field where the head of flat-spring 4b contacts
3c The gear tooth of a rack
4 Flat-Spring Whole
4a The flat spring which always acts at the time of a leading-screw revolution is shown.
4b The flat spring which acts on the variation rate of the direction from which the rack which is this invention separates from a leading screw is shown.
5 Screw
6 Step Motor
7 Leading-Screw Electrode Holder
8 Spindle Motor
8b The turntable of a disk

[Translation done.]

DRAWINGS

[Drawing 1]